MCP Amendments Discussion:

Use of an Upper Confidence Limit (UCL_x) of the Mean Concentration as a Conservative Estimate of the Exposure Point Concentration (EPC)

QUESTIONS FOR COMMENT

(on draft regulations)

1. Need for a required statistical treatment of EPCs (versus status quo)
2. Criteria by which the required use of a statistical approach is determined
3. Selection of appropriate statistical approach
4. Target Confidence Level when using statistical approach

310 CMR 40.0926

(5) In estimating the Exposure Point Concentration, the objective shall be to identify a conservative estimate of the average concentration contacted by a receptor at the Exposure Point over the relevant exposure period.

How to Identify a Conservative Estimate of the Average Concentration

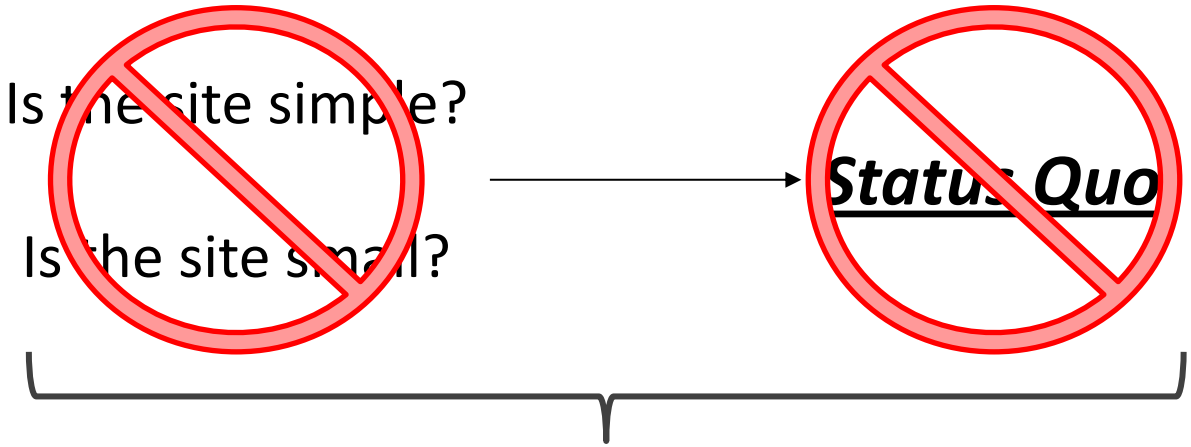
Is the site simple? (discrete source) → Is the site small? (< 2,000 ft ^{2}) → ***Status Quo***

Status Quo → Judgmental sampling (biased to more contaminated areas)

Judgmental sampling (biased to more contaminated areas) → **Arithmetic average**

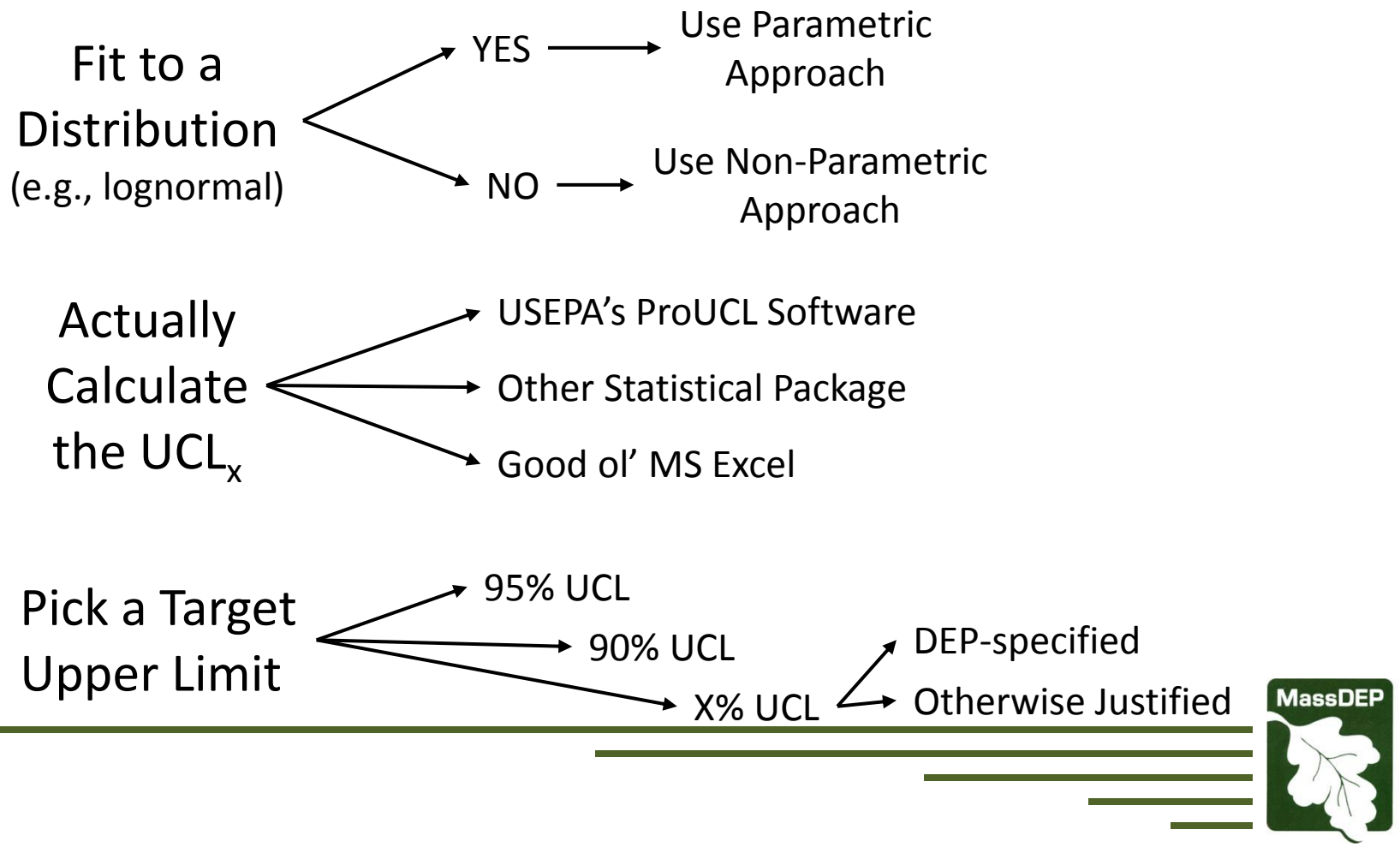
- 75/10 Rule; *or*
- Justification

How to Identify a Conservative Estimate of the Average Concentration



- More systematic sampling; *and*
- Statistical estimate of the EPC

How to Identify a Conservative Estimate of the Average Concentration



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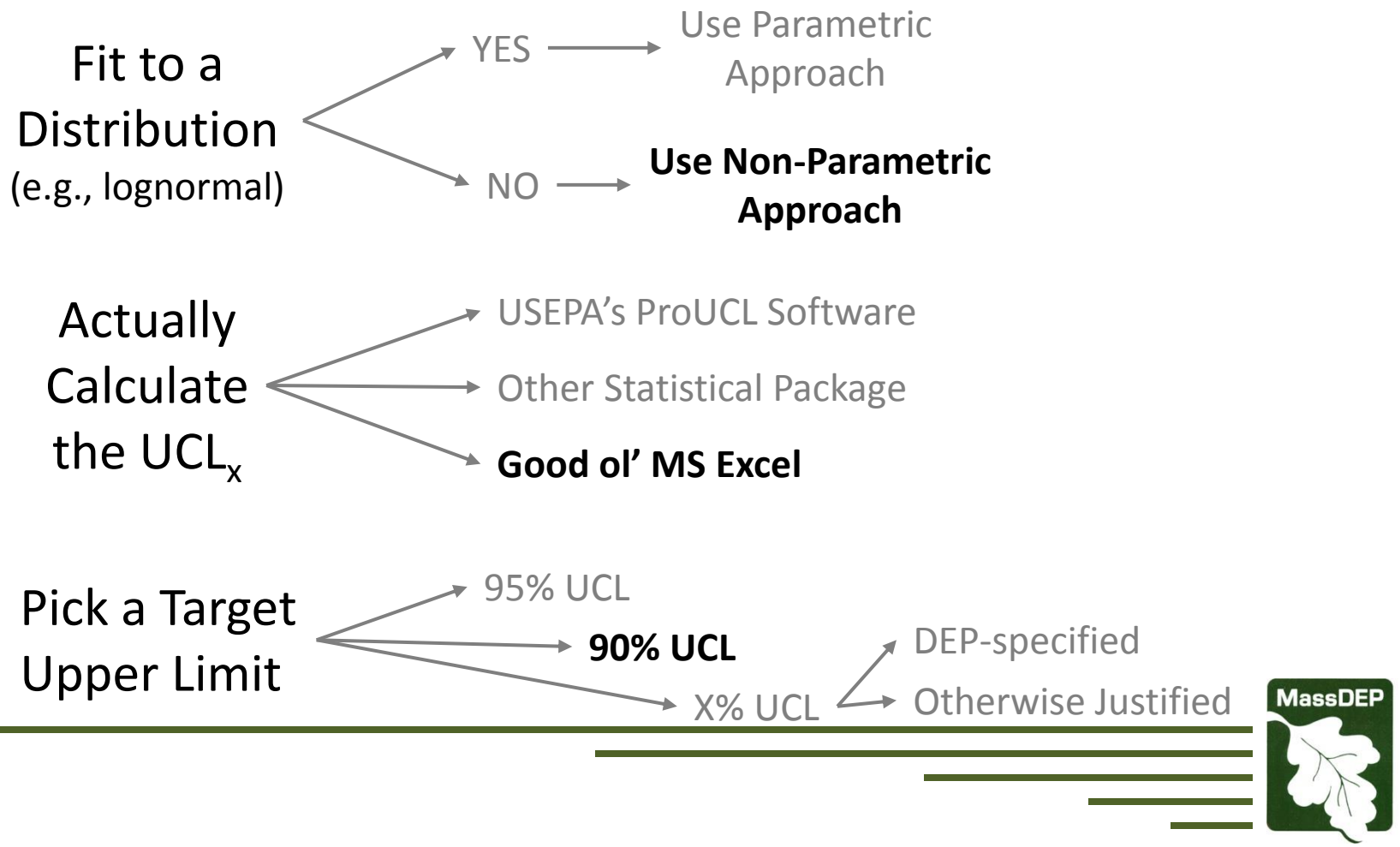
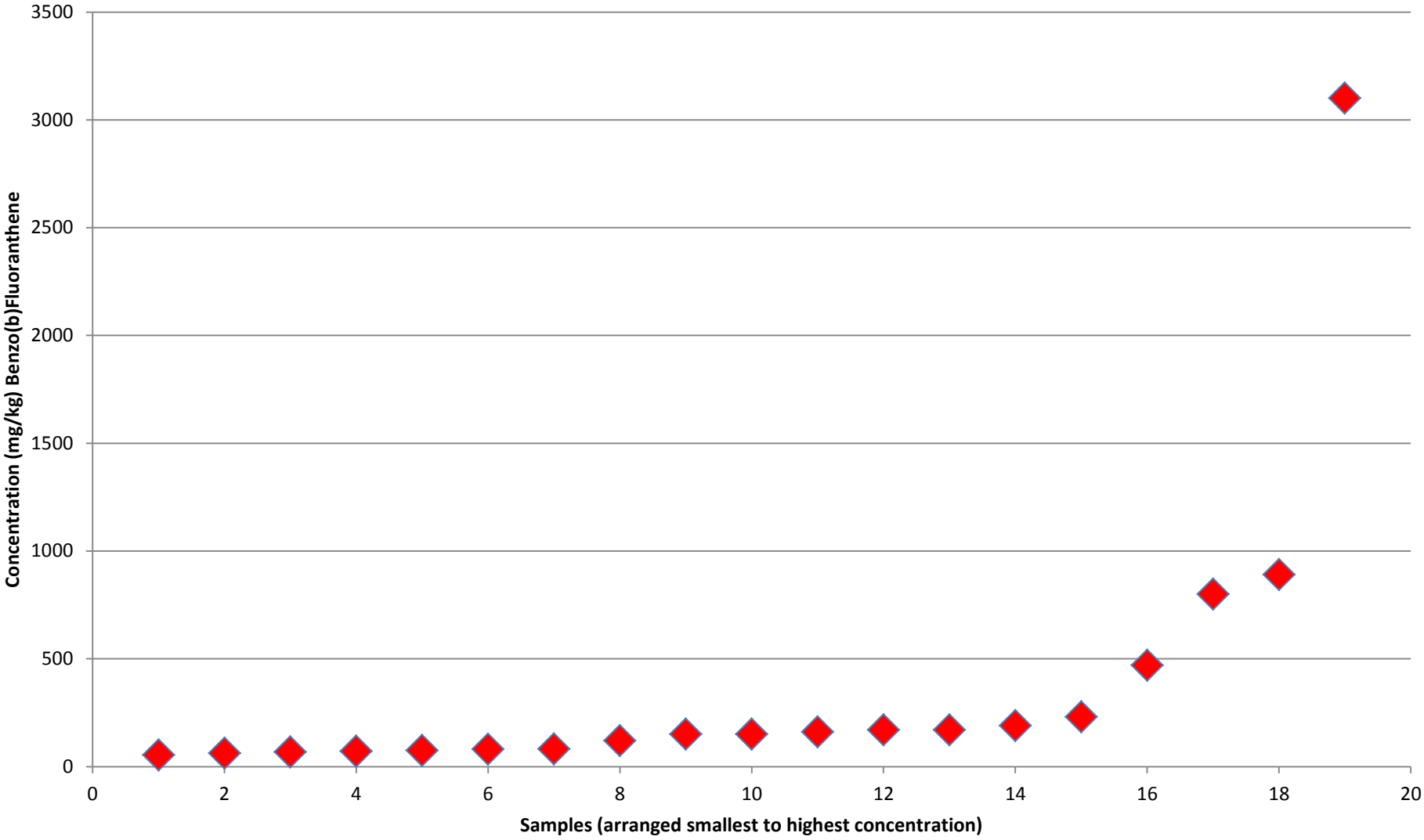


EXAMPLE: 19 Benzo(b)Fluoranthene Samples at a Site



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EXAMPLE: Application of Chebyshev UCL Approach

Chem	Values	ND	Mean	X - Mean	$(X\text{-}Mean)^2$	sum $(x\text{-}mean)^2$	n	S	UCL-95	UCL-90
		3/19								
Benzo(b)Fluoranthene	53	•	373	-320	102501	8884043	19	703	**1076**	**857**
	890		373	517	267126					
	3100		373	2727	7435668					
	67		373	-306	93733					
	470		373	97	9378					
	170		373	-203	41273					
	82		373	-291	84773					
	120		373	-253	64089					
	80	•	373	-293	85942					
	800		373	427	182194					
	160		373	-213	45436					
	170		373	-203	41273					
	75		373	-298	88898					
	62	•	373	-311	96819					
	71		373	-302	91299					
	190		373	-183	33547					
	150		373	-223	49799					
	230		373	-143	20494					
	150		373	-223	49799					

MassDEP

Chebyshev UCL Calculations

$$S = \sqrt{\frac{1}{n-1}\sum(X - \bar{X})^2}$$

Excel formula

=SQRT(((1/(I9-1))*H9))

$$UCL_{1-\alpha} = \bar{X} + \sqrt{\frac{1}{\alpha} - 1} * \left(\frac{S}{\sqrt{n}}\right)$$

Excel formula

=E9+(SQRT((1/0.1)-1)*(J9/SQRT(I9)))

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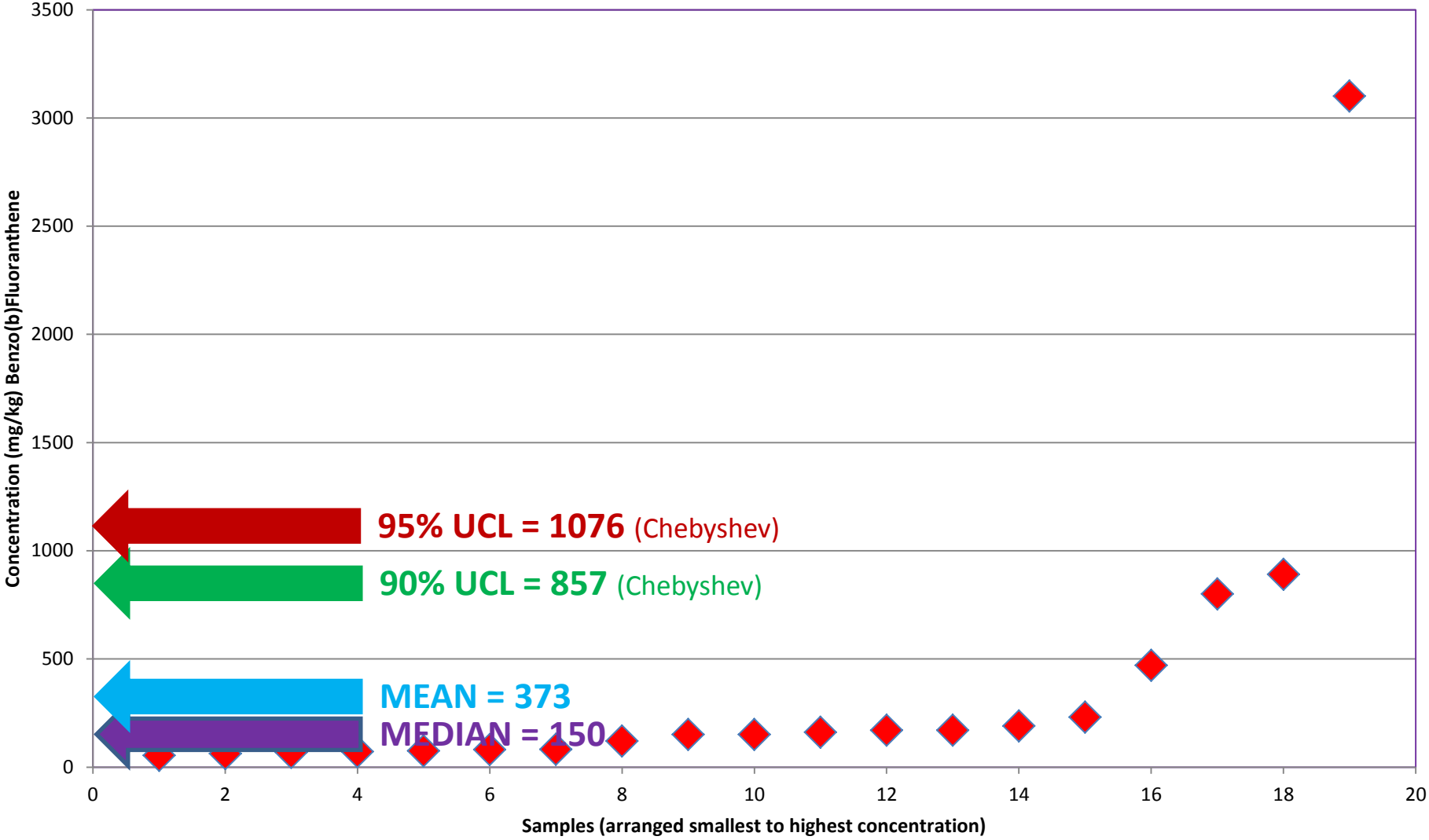

QUESTIONS FOR COMMENT

(on draft regulations… NOT NOW)

1. Need for a required statistical treatment of EPCs (*versus* status quo *versus* USEPA & Other States)
2. Criteria by which the required use of a statistical approach is determined
3. Selection of appropriate statistical approach (recommended Chebyshev)
4. Target Confidence Level when using statistical approach
   (recommended 90% when using Chebyshev)